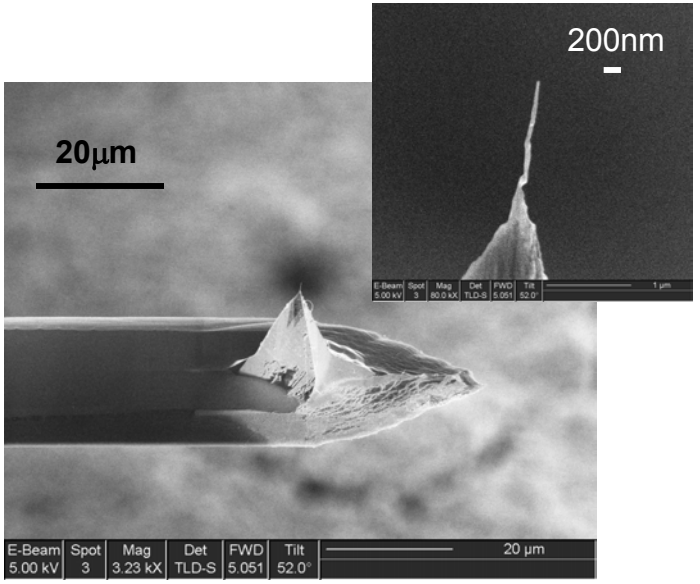
Integration of Carbon Nanotubes, Magnetic Nanocrystals, and Silicon Microstructures for Ultra-High-Resolution Magnetic Force Microscopy

NIRT-0103548

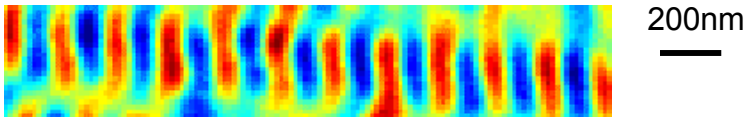
PI: Kathryn A. Moler, Stanford University

co-PI's: Moungi Bawendi, MIT; Hongjie Dai, Stanford; Tom Kenny, Stanford

Magnetic force microscopy (MFM) is the most important imaging technique for magnetic materials, which are essential to the information industry. MFM is generally limited to ~100nm spatial resolution. We are investigating ways to achieve sub-30-nm spatial resolution MFM. In the process, we are developing new techniques to fabricate nano-magneto-mechanical systems.



SEM images of a micromachined cantilever with a 60-nanometer Ni-coated nanotube tip.



MFM image, with the above sensor, of a track on a Maxtor Fireball 40GB hard drive. Smallest features observed so far are 47nm.

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Education:

Two postdocs, nine graduate students, and two undergraduates have participated in this project, developing the skills to become major contributors to nanoscale science and engineering.

CRISM

Next-Generation Instrumentation:

On November 7, the PI will make the first public presentation of these new magnetic sensors to industrial researchers and managers at the Workshop on Emerging Magnetic Nanotechnologies sponsored by the Center for Research on Information Storage Materials.